REMARKS

Reconsideration and further examination are requested.

Disposition of the Claims

33 claims were presented during prosecution.

Claims 1-13, 21, & 24-25 are canceled without prejudice or disclaimer.

Claims 14-20, 22-23, & 26-33 are pending in the application.

Claims 14-18, 20, & 26-30 are withdrawn from consideration.

Claims 19, 22-23, & 31-33 are rejected.

Claims 19 & 31 are currently amended, without prejudice or disclaimer.

Support for each amended or new claim is found in the as-filed specification.

Claim 19 recites *a wastewater which includes the COD components produced and discharged in a gas purification process*. Support is believed apparent throughout the as-filed specification.

Claim 19 recites *an alkaline reagent adding unit that adds an alkaline reagent in the wastewater treatment bath so that a pH of the wastewater treatment bath is within a range from 7 to 12 based upon the alkaline reagent*. Support for this amendment is in the specification as filed, e.g., paragraph [0051] as well as the description of the embodiments of Fig. 13 and those of Fig. 1 and Fig. 15. Along these lines, this language clarifies that "the COD components may be treated by oxidizing it with an oxidizing reagent under an alkaline condition followed by oxidizing it with an oxidizing reagent under an acidic condition followed by irradiating an ultraviolet ray on it."

Claim 19 recites *a pump that feeds an oxidizing water oxidized in the wastewater treatment bath and thereafter returns the same to the wastewater treatment bath, so as to circulate the wastewater*. Support for this amendment is in the specification as filed, e.g., paragraph [0069], Fig. 15. Along these lines, this language emphasizes a feature of the embodiment

of Fig. 15, namely, that "the wastewater 11 was fed to the ultraviolet treatment unit 13 using the pump 19 and then returned to the wastewater treatment bath 12."

Claim 31 contains analogous amendments.

35 U.S.C. § 112, ¶ 2

Claims 19, 22, 23, & 31-33 were rejected as indefinite for reciting, in independent claims 19 and 31, "an ultraviolet ray-transmitting reaction bath for forcing the oxidized water fed from the pump to inflow." FOA, ¶¶ 1-3. This limitation, according to the Examiner, creates confusion in the claims because it is unclear what further structure is implied by this function of forcing the oxidized water fed from the pump to inflow. FOA, ¶ 3.

Claim 19 recites *an ultraviolet ray-transmitting reaction bath that receives the oxidized water fed from the pump therein, wherein the ultraviolet ray-transmitting reaction bath is arranged on the downstream side of the acid treatment bath.* This language clarifies the position of an ultraviolet ray-transmitting reaction bath and what is meant by the wording "for forcing the oxidized water fed from the pump to inflow." Claim 31 recites analogous language. As such, the rejection should be withdrawn.

Claim objections

Claims 19, 22, & 23 or claims 31, 32, & 32, respectively, were objected to as being substantial duplicates thereof. FOA, ¶4. According to the Examiner, three pairs of claims cover the same thing, despite a slight difference in wording. The present amendment is believed to have rendered this issue moot. Thus, the objection should be withdrawn.

Obviousness rejection

Claims 19, 22-23, & 31-33 were rejected as obvious over Noguchi in view of Shadman and Horton. FOA, ¶¶ 5-12. Obviousness is determined in view of the *Graham* factors, several of which are in dispute here. The record is developed and will not be repeated here. For the reasons noted below, each rejection cannot make out a *prima facie* case of obviousness and should be withdrawn.

Independent claim 19 is directed to the following:

A wastewater treatment apparatus capable of removing COD components contained in a wastewater which includes the COD components produced and discharged in a gas purification process of a gasification facility comprising:

(A) a wastewater treatment bath that treats the wastewater containing the COD components under alkaline condition;

(B) an alkaline reagent adding unit that adds an alkaline reagent in the wastewater treatment bath so that a pH of the wastewater treatment bath is within a range from 7 to 12 based upon the alkaline reagent;

(C) an oxidizing reagent adding unit that adds an oxidizing reagent in the wastewater treatment bath to decompose the COD components;

(D) an ultraviolet treatment unit that irradiates an ultraviolet ray for decomposing the COD components;

(E) a pump that feeds an oxidized water oxidized in the wastewater treatment bath and thereafter returns the same to the wastewater treatment bath, so as to circulate the wastewater; and

(F) an acid treatment bath having an acid adding unit that adds an acid, the acid treatment bath provided on a downstream side of the wastewater treatment bath and on an upstream side of the ultraviolet treatment unit, wherein the acid treatment bath has a pH within a range of 2 to 4;

wherein the ultraviolet treatment unit comprises:

(G) an ultraviolet ray-transmitting reaction bath that receives the oxidized water fed from the pump therein, wherein the ultraviolet ray-transmitting reaction bath is arranged on the downstream side of the acid treatment bath; and

(H) a pair of ultraviolet lamps disposed outside the reaction bath, so that an ultraviolet ray emitted from the pair of ultraviolet lamps passes through the ultraviolet ray-transmitting reaction bath and is irradiated on the oxidized water to

decompose the COD components in the oxidized water."

For convenience, references (A) to (H) are put on essential features of the claim 19 as amended.

The problem to be solved by the present inventors was to reliably decompose the COD components such as thiosulfuric ions and formic acid, which are persistent substances in the wastewater discharged from a coal gasification facility. Herein, the persistent substances in the wastewater described in connection with the present description are so-called COD components, which may include thiosulfuric acid, formic acid, cyanogen, thiocyanogen, phenol, benzene, benzoic acid, chlorophenol, chloroaniline, aminobenzoic acid, acetic acid, and hydantoin, but do not limited to them. Taking thiosulfuric acid and formic acid as examples, the persistent substances are described below (See paragraphs [0002] to [0006]).

According to the present description, persistent substances in a wastewater may be decomposed by treating it with an oxidizing reagent under an alkaline condition. The persistent substances may be further treated by oxidizing it with an oxidizing reagent under an alkaline condition followed by oxidizing it with an oxidizing reagent under an acidic condition. Further, the persistent substances may be decomposed by oxidizing it with an oxidizing reagent followed by irradiating an ultraviolet ray on it.

In particular, where the wastewater produced in a gas purification process and discharged from the gasification facility is treated, COD components of the gasified wastewater may be efficiently treated by combining oxidization of thiosulfuric ions by adding an oxidizing reagent and decomposition of organic materials including formic acid through an advanced oxidation process using a combination of an ultraviolet ray and an oxidizing reagent.

On the contrary, Noguchi discloses a method for decomposing bromic acid by a photocatalyst and an apparatus therefor. Noguchi discloses an apparatus including a first section (ozonization vessel) (52) (which is comparable to the feature (A)), a diffuser (54) (which is comparable to the feature (C)), a first pH adjustment section (60) (which is comparable to the feature (B)), a UV lamp (64) (which is comparable to the feature (G)) and a tube (65) (which is comparable to the feature (H)).

The invention of Noguchi belongs to classification IPC C07C2/00, C07C4100, and Noguchi discloses an apparatus for decomposing bromide ions of drinking water as disclosed in paragraphs [0002] to [0006]. Therefore, the apparatus of Nouchi is different in structure and arrangement from an embodiment falling within the scope of claim 19.

The object to be removed in Noguchi is a bromate ion (BrO^{3-}) which can be generated by dissolving potassium bromate in water. Bromate ion can also be produced as a by-product by oxidizing bromide ion (Br^{-}) dissolved in water, in the ozonization or accelerated oxidation treatment of drinking water.

Figure 12 of Noguchi discloses a total treatment system to decompose organic matters of the liquid, sufficiently sterilize the liquid at the first part ozonization stage, by utilizing an existence of a pH range in which bromate ion (BrO^{3-}) can be effectively decomposed by photocatalytic treatment, and thereafter removing the bromate ion (BrO^{3-}) which will be expected to be generated by the ozonation at the latter part photocatalytic stage.

With regard to the feature (A) of claim 19 or the wastewater treatment bath, this is comparable to Noguchi's first section or the ozonization vessel (52). Ozone gas generated by an ozone generator (53) is introduced into this ozonization vessel (52) through a diffuser (54). At this time, if the bromate ion (BrO^{3-}) exists in flowing water, the bromate ion (BrO^{3-}) which is an object to be removed will be generated in this vessel (52). Thus, with respect to this feature, the ozonization vessel (52) of Noguchi differs from the feature (A) of claim 19. Accordingly, Noguchi fails to teach or suggest the feature (A).

With regard to the feature (B) of claim 19 or the alkaline reagent adding unit, this is not disclosed in Noguchi.

With regard to the feature (C) of claim 19 or the oxidizing reagent adding unit, this is comparable to Noguchi's diffuser (54). When in use, the apparatus of claim 19 makes it possible for the addition of the oxidizing reagent being performed in order to proceed with the decomposition of COD components to be removed (See paragraph [00281]). Further, Noguchi fails to disclose or suggest the addition of the oxidizing reagent under an alkaline condition.

With regard to the feature (D) of claim 19 or the ultraviolet treatment unit, this is comparable to a combination of an UV lump (64) and a tube (65). However, Noguchi fails to disclose or suggest the ultraviolet treatment unit having the function for decomposing the COD components.

With regard to the features (E), (F), (G) and (H) of claim 19, these features are not disclosed in Noguchi.

Neither Shadman nor Horton was applied to remedy these deficiencies. More specifically, Examiner concluded that Noguchi is different from embodiments of claims 19 & 31, in that Noguchi does not teach a pump which feeds oxidized water from the wastewater treatment bath to the ultraviolet treatment unit reaction bath which receives the oxidized water from the pump, or that the pair of UV lamps is provided outside the reaction bath. Shadman was used to address the former, while Horton was used to address the latter. Regardless of whether or not the Examiner's findings are true, for the reasons just noted above, Applicants submit that Noguchi, Shadman, and Horton, alone or in combination, fail to render obvious an embodiment falling within the scope of claim 19 or 31. As to these claims, the rejection should be withdrawn.

Regarding the remaining rejected claims, each depends from claim 19 or 31. Thus, these claims are allowable for reasons offered above.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN HAM & BERNER, LLP

/Sean Allen Passino, reg. no. 45943/
Sean A. Passino, reg. no. 45943 for
Benjamin J. Hauptman
Registration No. 29,310

1700 Diagonal Road, Suite 300
Alexandria, Virginia 22314
(703) 684-1111
(703) 518-5499 Facsimile
Date: 2011-11-09
BJH/SAP/hmw